

A SPECIAL EFFECTS CLOUD GENERATION SYSTEM

BACKGROUND OF THE INVENTION

Claim of Priority

The present application is a continuation application of previously filed application having Serial No. 10/215,987 which was filed on August 9, 2002 which is set to mature as U.S. Patent No. 6,619,048 on September 16, 2003, which is a continuation application of previously filed, application having Serial No. 09/603,284 which was filed on June 26, 2000 which matured into U.S. Patent No. 6,430,940 on August 13, 2002 and which is based on and claims priority under 35 U.S.C. Section 119(e) to provisional patent application having been filed in the U.S. Patent and Trademark Office, having Serial No. 60/173,656 and a filing date of December 30, 1999.

Field of the Invention

The present invention relates to a special effects cloud generation system structured to produce a preferably controlled and concentrated cloud or fog like effect, in a defined area, and in a manner which is substantially regulatable and achieves evenly pressurized dispersement. The system further promotes a high degree of manageability of the generated effects cloud, maximizes the use of the cryogenic components for actual cloud generation, and is substantially safe to employees in a

1 populated area. Additionally, the effects generation system
2 relates to the production of the special effect cloud which in
3 addition to enhancing an appearance of a particular location, is
4 also structured to quickly and effectively cool the location in
5 a cost effective and repeatable manner.

6
7 DESCRIPTION OF THE RELATED ART

8 In a many fields of art, but especially in the fields of
9 art relating to dance club productions and staging productions,
10 it is desirable to utilize cloud or fog type effects in order to
11 enhance the look and/or ambiance of the particular location.
12 Traditionally, such cloud type effects are generated utilizing
13 devices often referred to as "fog machines", wherein a water or
14 oil based chemical solution is atomized and heated, spraying a
15 cloud into the air. This cloud, however, is difficult to
16 control or direct, often has many impurities associated
17 therewith, and causes chemicals to linger in an area for an
18 extended period of time. In addition to those types of fog
19 machine structures, other more advanced machines have also been
20 utilized in an attempt to produce a special effects cloud
21 through cooling. In such devices, water vapor or another
22 chemical is atomized and super cooled, such as with dry ice or
23 another cold material, in order to produce a fog type
24 condensation that stays low to the ground. Unfortunately, such
25 conventional systems are often substantially difficult to

1 control and regulate in order to provide a sufficient effect,
2 and produce a fog that merely migrates over an area in an
3 uncontrolled fashion. Furthermore, such existing systems often
4 have the associated draw back of only moderately condensing the
5 water vapor or atomized chemical, such that "fog" produced tends
6 to be damp and/or wet, often creating a dampness or wetness on
7 contacted surfaces, such as on a dance floor, which creates a
8 potential hazard, and tends to create an uncomfortable, humid
9 environment for persons in the area. As a result, it would be
10 desirable to develop a way of generating a more concentrated
11 cloud or fog, which will minimize water build up in a particular
12 location and will maintain and/or enhance the comfort level of
13 individuals in a location wherein the effect is generated.

14 Cryogenic fluids are generally a class of fluids formed by
15 maintaining normally gaseous elements at a sufficiently low
16 temperature and/or high pressure such that it can exist in
17 generally a liquid form. Such cryogenic fluids can therefore
18 include liquid nitrogen, argon, oxygen, helium, liquid carbon
19 dioxide, and a variety of other normally gaseous materials and
20 elements maintained in liquid form. Because of the difficulties
21 normally associated with maintaining a very low temperature
22 environment, such cryogenic fluids are typically contained in
23 secure containers having a vacuum jacketed or encased structure.
24 This vacuum jacketing functions to help maintain the desired
25 liquid state of the cryogenic fluid, while also providing for a

1 degree of transportability and usability of the container
2 wherein the cryogenic fluid is stored, by reducing the need to
3 constantly keep the container in a highly refrigerated area.

4 Of course, a problem that results from maintaining such
5 cryogenic fluids in the necessary liquid state relates to the
6 dispensing of quantities of the cryogenic fluid as needed. In
7 particular, if the container is merely opened in a standard
8 environment, the liquid will not "pour" out like a conventional
9 liquid, but rather, the liquid will revert to its gaseous state
10 immediately. Accordingly, it has been necessary to develop an
11 effective mechanism for delivering the cryogenic fluid
12 substantially in its liquid state. Presently, vacuum jacketed
13 cryogenic fluid containers are equipped with self pressurizing
14 assemblies so as to provide for the appropriate delivery of the
15 cryogenic fluid from the container in liquid form when needed.
16 Such self pressurization generally involves the expansion of a
17 quantity of the cryogenic fluid in its liquid state, such as by
18 removing it from its contained environment, so as to result in
19 the formation of a quantity of gas, that is then returned into
20 the container to achieve necessary outflow and delivery
21 pressurization of the cryogenic fluid, preferably in its liquid
22 state. As a result, the pressurized gas which result from the
23 expansion of the cryogenic fluid in liquid state serves to push
24 remaining amounts of useable cryogenic fluid from the tank for
25 effective delivery and utilization. While such a self

1 pressurization delivery technique may be sufficient in some
2 applications for the cryogenic fluid, in the field of effects
3 generation, such self pressurization is seen to be less
4 effective than desirable.

5 In particular, such self pressurization is only capable of
6 achieving limited amounts of outflow pressurization at a given
7 time, based upon the amount of liquid that is allowed to expand
8 into its gaseous state. Accordingly, the outflow pressurization
9 is not continuous, which among other problems can result in un-
10 even outflow at different delivery locations, and cannot be
11 effectively regulated, such as to increase or decrease the
12 delivery amounts. Furthermore, as the cryogenic fluid itself is
13 being used for pressurization, quantities of the often expensive
14 cryogenic fluid are used up and cannot be utilized for actual
15 effect generation. As a result, it would be beneficial to
16 provide a cloud effect generating system which is capable of
17 utilizing cryogenic fluid in a manner which can deliver the
18 cryogenic fluid in a necessary state to a desired effect
19 location in a uniform, controllable, and continuously
20 pressurized state, which does not compromise the quality and/or
21 effectiveness of the cryogenic fluid, and does not result in the
22 waste of often costly cryogenic fluid for self pressurization.

23 24 SUMMARY OF THE INVENTION

25 The present invention relates to an effects generation

1 system structured to produce a controlled special effect cloud
2 at a particular location. In particular, the effects generation
3 system includes a cryogenic fluid source. Preferably, the
4 cryogenic fluid source includes at least one container in which
5 a quantity of cryogenic fluid, such as preferably liquid
6 nitrogen is contained in its liquid state. Furthermore, the
7 cryogenic fluid source includes at least a fluid outlet, from
8 which a preferably pressurized flow of the cryogenic fluid
9 emerges for distribution, as well as a fluid inlet, such as a
10 "vent" valve of the container.

11 Specifically, the present system also preferably includes
12 a pressurization assembly coupled at a fluid inlet. In
13 particular, the pressurization assembly is operatively
14 associated with the cryogenic fluid source, and is structured to
15 selectively maintain an outflow of the cryogenic fluid, under
16 pressure, such as from the container. As will be described, this
17 is preferably achieved by pressurizing the interior of the
18 container and generally pushing the cryogenic fluid out. The
19 outflow of fluid passes through the fluid outlet of the
20 cryogenic fluid source and through a delivery assembly.

21 The delivery assembly is operatively connected with the
22 fluid outlet and is structured to receive and deliver the
23 pressurized outflow of the cryogenic fluid to a desired area
24 where the effect is to be generated, preferably in a prearranged
25 and controllable array. Along these lines, the delivery

1 assembly preferably includes a plurality of delivery ports.
2 Based at least in part on the functioning of the pressurization
3 assembly, however, a substantially continuous pressure of the
4 outflow of cryogenic fluid is maintained, and equalization of
5 the fluid flow pressure at each of the delivery ports of the
6 delivery assembly is attained. As a result, the cryogenic fluid
7 is delivered to a desired area in a substantially even and
8 uniform manner that can be more effectively controlled and
9 utilized.

10 The effects generation system of the present invention
11 further includes a quantity of reactive fluid. The reactive
12 fluid is disposed in reactive proximity with the cryogenic fluid
13 being delivered into the desired area, such as from the delivery
14 ports. Moreover, the reactive fluid is structured and disposed
15 such that it will interact with the delivered cryogenic fluid,
16 the cryogenic fluid at least partially causing a phase change in
17 the reactive fluid. It is the phase change exhibited by a
18 volume of the reactive fluid that results in the formation of
19 the special effect cloud. Preferably, the reactive fluid
20 includes water molecules, such as provided by a steam generator
21 and/or existing as humidity in the ambient air at the delivery
22 area.

23 These and other features and advantages of the present
24 invention will become more clear when the drawings as well as
25 the detailed description are taken into consideration.

1 BRIEF DESCRIPTION OF THE DRAWINGS

2 For a fuller understanding of the nature of the present
3 invention, reference should be had to the following detailed
4 description taken in connection with the accompanying drawings
5 in which:

6 Figure 1 is a schematic illustration of an embodiment of
7 the effects generation system of the present invention; and

8 Figure 2 is an isolated view illustrating the utilization
9 of a fluid collection assembly in connection with the effects
10 generation system of the present invention.

11 Like reference numerals refer to like parts throughout the
12 several views of the drawings.

13
14 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

15 As shown throughout the Figures, the present invention is
16 directed towards an effects generation system, generally
17 indicated as 10. In particular, the effects generation system
18 is configured preferably to produce a controlled special effect
19 cloud in a defined area, such as on a stage or in a room.
20 Moreover, the system 10 of the present invention is configured
21 to produce that effect cloud in a safe manner which can also
22 function to effectively cool a delivery area.

23 The effects generation system 10 of the present invention
24 includes a cryogenic fluid source 20. In particular, the
25 cryogenic fluid source 20 preferably includes a quantity of

1 cryogenic fluid contained in a useable and distributable form.
2 Furthermore, although a variety of different cryogenic fluids
3 may be incorporated into the present invention, in the
4 illustrated embodiment, the cryogenic fluid includes liquid
5 nitrogen. Specifically, nitrogen, as with other cryogenic
6 fluids, typically exists in a gaseous state. When, however, the
7 gas is substantially cooled and/or is subjected to a pressure
8 increase, the gas is transformed into a liquid state, which is
9 the preferred state for the cryogenic fluid within the context
10 of the present invention. By way of example, the cryogenic
11 fluid may also include liquid carbon dioxide, liquid air, and a
12 variety of other compounds which exist in a substantially cold,
13 yet preferably fluid state.

14 To effectively contain the cryogenic fluid, the cryogenic
15 fluid source 20 also preferably includes at least one container
16 21. The container 21 is preferably of strong stainless steel,
17 rigid construction which is able to store and contain the
18 cryogenic fluid, maintaining its substantially cold state.
19 Exemplary of the types of containers which may be preferred are
20 the cryogenic fluid containers sold under the trademarks Dura-
21 Cryl or Cryo-Cyl.

22 The container 21 preferably includes an open interior
23 chamber 22, wherein the cryogenic fluid is actually maintained,
24 as well as a vacuum chamber 24 surrounding the interior chamber
25 22. The vacuum chamber 24 is structured to help preserve the

1 necessary temperature conditions of the cryogenic fluid.

2 The cryogenic fluid source 20, and preferably the container
3 21, also preferably includes a plurality of valves and conduits
4 associated therewith so as to preserve the pressurization and
5 stability of the cryogenic fluid contained therein. Among these
6 features are at least one fluid inlet 26, such as that
7 associated with the "vent" valve, and at least one fluid outlet
8 28, such as that associated with the "liquid valve". The fluid
9 inlet 26 and the fluid outlet 28 are preferably disposed in
10 fluid flow communication with the interior chamber 22 of the
11 container 21. Moreover, in the illustrated embodiment, the
12 fluid outlet 28 and fluid inlet 26 are preferably connected in
13 fluid flow communication with generally opposite ends of the
14 interior chamber 22 of the container 21. For example, in the
15 illustrated embodiment, the fluid outlet 28 is preferably
16 disposed generally near a bottom of the container 21, so as to
17 facilitate the passage of the cryogenic fluid, and preferably
18 the liquid nitrogen, from the container 21. Conversely, the
19 fluid inlet 26 is preferably disposed generally near a top
20 portion of the container 21. Such positioning, although not
21 required, is preferred, as will become apparent, so as to more
22 effectively effectuate the outflow of cryogenic fluid for use in
23 the effects generation. Of course other valves and conduits
24 normally present in such containers for pressure regulation and
25 equalization may still be present. The effects generation

1 system 10 of the present invention further includes a
2 pressurization assembly, generally 30. In particular, the
3 pressurization assembly 30 is operatively associated with the
4 cryogenic fluid source 20, and preferably with the container 21,
5 so as to selectively and variably maintain an outflow of the
6 cryogenic fluid from the container 21 under pressure.
7 Furthermore, the pressurization assembly 30 is preferably
8 structured to maintain a substantially continuous outflow of the
9 cryogenic fluid in order to achieve substantial fluid flow
10 pressure equalization at each of a plurality of delivery ports
11 46, to be described in further detail subsequently. In the
12 illustrated embodiment, the pressurization assembly 30 is
13 operatively coupled with the container 21 at the fluid inlet 26.
14 Moreover, the pressurization assembly 30 preferably includes a
15 pressurized fluid source 32. The pressurized fluid source 32
16 preferably includes one or more tanks containing a
17 pressurization fluid, such as a highly pressurized and
18 compressed gas. Furthermore, in the preferred embodiment, the
19 pressurization fluid 32 preferably includes a compatible
20 elemental makeup with that of the cryogenic fluid disposed
21 within the container 21, thereby minimizing and preferably
22 avoiding any contamination of the cryogenic fluid. In
23 particular, the pressurized fluid source 32 is coupled into
24 fluid flow communication, such as by one or more conduits, at
25 the fluid inlet 26 of the cryogenic fluid source 20. In order

1 to generate an outflow of cryogenic fluid from the cryogenic
2 fluid source 20, the pressurization fluid is allowed to flow
3 from the pressurized fluid source 32 into the container 21,
4 accordingly pushing out the cryogenic fluid contained therein
5 and resulting in the outflow of cryogenic fluid through the
6 fluid outlet 28. As a result, although a mixing does not occur,
7 there is at least some contact and/or interaction between the
8 pressurization fluid and the cryogenic fluid. Accordingly, by
9 utilizing compatible elemental makeups, the cryogenic fluid
10 contained within the container 21 is not contaminated by the
11 pressurization fluid and its effectiveness is not generally
12 diminished and/or wasted. By way of example, in the illustrated
13 embodiment wherein the cryogenic fluid includes liquid nitrogen,
14 the pressurization fluid within the pressurized fluid source 32
15 preferably includes nitrogen gas. Although not preferred or
16 recommended, it is recognized that air under pressure, carbon
17 dioxide, and/or another pressurization fluid could also be
18 utilized, however, the preferred compatible materials are
19 utilized to minimize waste and contamination, especially in
20 light of the often expensive cost of the cryogenic fluid, such
21 as a liquid nitrogen.

22 Additionally in the illustrated embodiment, the
23 pressurization assembly 30 may also include a pressure regulator
24 34, at least partially interposed between the fluid inlet 26 of
25 the container 21 and the pressurized fluid source 32. In

1 particular, the pressure regulator 34 is able to monitor the
2 pressurized flow of the pressurization fluid into the container
3 21 and can also be utilized to adjust that pressure. As can be
4 appreciated, by adjusting the pressure at which the
5 pressurization fluid is allowed to flow into the container 21,
6 the outflow of cryogenic fluid through the fluid outlet 28 can
7 also be regulated. Moreover, utilizing the described
8 pressurization assembly 30, a substantially continuous outflow
9 pressurization can be maintained, thereby keeping the cryogenic
10 fluid in a readily available state which does require recharge
11 or pressurization before use. Also, if a plurality
12 pressurization fluid sources 32 are utilized, they may also be
13 coupled with the pressure regulator 34 and/or be coupled in line
14 with one another, thereby substantially ensuring that a
15 sufficient supply of pressurization fluid is available to
16 maintain a desired degree of outflow of the cryogenic fluid and
17 to ensure substantial equalization during delivery. With
18 particular regard to the equalization requirements, it is
19 recognized that when a flow is initiated, delivery ports which
20 are closest to the cryogenic fluid source 20 will tend to at
21 least initially exhibit an increased fluid flow pressure.
22 Utilizing the preferred system of the present invention,
23 however, a continuous outflow of the cryogenic fluid is
24 maintained, and the fluid flow pressure at each of the delivery
25 ports 46 will eventually and substantially equalize with one

1 another regardless of their disposition relative to the
2 cryogenic fluid source 20.

3 In order to effectively deliver the cryogenic fluid into a
4 desired area, and preferably in a select and defined pattern or
5 array, the present invention further includes a delivery
6 assembly, generally indicated as 40. The delivery assembly 40
7 preferably includes at least one elongate delivery conduit 42
8 having a plurality of delivery ports 46 disposed in fluid flow
9 communication therewith. The delivery conduit 42 is operatively
10 coupled in fluid flow communication with the fluid outlet 28 of
11 the container 21, and as a result the outflow of cryogenic fluid
12 flows into the delivery conduit 42, eventually passing through
13 the one or more delivery ports 46. Additionally, it may also be
14 preferred that the delivery conduit 42 be vacuum jacketed, as at
15 44, so as to substantially preserve the temperature and state of
16 the cryogenic fluid until passage through the one or more
17 delivery ports 46. In this regard, although complete vacuum
18 jacketing may be provided, it is generally most practical to
19 provide insulating vacuum jacketing up to approximately 10ft
20 from the delivery ports 46.

21 From the proceeding, it is also recognized that the
22 delivery ports 46 may be disposed in either a scattered
23 formation or in a predefined or variable pattern or array.
24 Furthermore, if desired, selective opening and/or closing of the
25 delivery ports 46 may be provided by conventional valve means,

1 such as through a motorized and/or other actuatable inlet and/or
2 outlet. Additionally, in the illustrated embodiment, each of
3 the delivery ports 46 preferably includes a nozzle 48
4 operatively disposed thereon. The nozzles 48, which may be
5 separate components or apertures formed directly in the
6 conduits, are configured so as to regulate and/or control the
7 pressurized flow of cryogenic fluid from the delivery ports 46,
8 and to preferably substantially atomize or disperse the outflow
9 of cryogenic fluid into substantially small particles for
10 delivery. Likewise, the one or more nozzles 48 could also be
11 adjustable so as to regulate the outflow of cryogenic fluid as
12 necessary. In this regard, a constant pressurization can be
13 maintained by the pressurization assembly 30 at each of the
14 delivery ports 46. However, in an embodiment wherein a
15 mechanical nozzle is used, through any of a plurality of
16 conventional control mechanisms the delivery ports 46, and in
17 particular the nozzles 48, can be selectively opened, either
18 completely, in gradual or varied amount and/or to achieve
19 specific patterns.

20 The effects generation system 10 of the present invention
21 further includes a quantity of reactive fluid disposed in
22 reactive proximity with the cryogenic fluid being delivered into
23 the desired area. Specifically, the delivered cryogenic fluid
24 is structured to interact with the reactive fluid and at least
25 partially cause a phase change in at least some of the reactive

1 fluid. It is this phase change that is sufficient to result in
2 the formation of the special effects cloud. In the preferred
3 embodiment, the reactive fluid includes water molecules,
4 preferably in the form of water vapor molecules disposed in
5 close proximity to the delivery ports 46 of the cryogenic fluid.
6 In such an embodiment, the cryogenic fluid essentially freezes
7 or sublimates the water molecules, that phase change resulting
8 in the formation of the special effects cloud through the
9 discoloration of each of the water molecules into a less
10 transparent or often white, generally solid molecular form.
11 Furthermore, this phase change is so extreme as a result of the
12 use of the cryogenic fluid, that substantially little if any
13 fluid condensation which would tend to make the desired area wet
14 or damp will result. Moreover, it is also recognized that the
15 phase change of the water molecules of the reactive fluid also
16 results in a substantially rapid cooling of the desired area.
17 As a result, it is seen that the effects generation system 10 of
18 the present invention may, in some embodiments and environments
19 function to provide a substantially rapid and effective cooling
20 system for the particular area without resulting in the
21 formation of moisture on individuals present and/or on other
22 surfaces in the area.

23 In many environments and situations, based upon the
24 humidity levels normally contained in ambient air, the reactive
25 fluid of the reactive fluid source preferably includes the water

1 molecules normally contained by the ambient air in the desired
2 area into which the cryogenic fluid is delivered. Of course,
3 however, in certain environments and/or climates, insufficient
4 water molecules may be contained by the ambient air to provide
5 the degree of cloud effect desired. Accordingly, in an
6 alternate embodiment, and as illustrated in Figure 1, a reactive
7 fluid distribution assembly 50 is also preferably provided. In
8 particular, the reactive fluid distribution assembly 50 is
9 structured to generate and deliver the reactive fluid to the
10 desired area, in preferably, but not necessarily, close,
11 reactive proximity with the delivered cryogenic fluid, so as to
12 result in the effective formation of the special effect cloud
13 58. Also in the illustrated embodiment, wherein the reactive
14 fluid includes water molecules, the reactive fluid distribution
15 assembly may include a steam generator. In such an embodiment,
16 the reactive fluid distribution assembly 50 also preferably
17 includes a distribution conduit 52 which delivers the reactive
18 fluid into substantially close proximity to the delivery ports
19 46 of the delivery assembly 40. In this regard, the
20 distribution conduit 52 is preferably disposed in generally
21 spaced apart relation from the cryogenic fluid delivery conduit
22 42 such that a premature phase change does not result in the
23 reactive fluid or the cryogenic fluid based on the proximity of
24 the conduits. Moreover, the distribution conduit 52 is also
25 preferably insulated, as at 53, to further prevent a premature

1 phase change of the reactive fluid prior to its passage from the
2 distribution conduit 52 through one or more distribution outlets
3 54. Still, however, the distribution outlets 54 are preferably
4 disposed in substantially close relation to the cryogenic fluid
5 delivery ports 46 so as to result in immediate interaction
6 between the reactive fluid and the cryogenic fluid, and the
7 formation of the special effects cloud 58. As can be
8 appreciated, if desired, the amount of reactive fluid passing
9 through the distribution outlets 54 may also be varied in order
10 to vary the effect desired.

11 Looking to Figure 2, in yet another embodiment of the
12 present invention, the effect generation system 10 may also
13 include a fluid collection assembly 60. In particular, the
14 fluid collection assembly 60, which in the illustrated
15 embodiment includes an expandable bladder, is structured to be
16 disposed, at least temporarily, in fluid collecting engagement
17 over one or more of the delivery ports 46 so as to collect a
18 quantity of the cryogenic fluid therein. Moreover, the fluid
19 collection assembly 60 is also preferably structured to abruptly
20 release the collected quantities of cryogenic fluid into the
21 desired area, such as through a rupturing of the expandable
22 bladder. In particular, by the abrupt release of a large
23 quantity of cryogenic fluid contained by the fluid collection
24 assembly 60, a more concentrated and dramatic special effect
25 cloud is created, also typically accompanied by a large noise,

1 such as resulting from the rupturing of the fluid collection
2 assembly 60 and the sudden release of cryogenic fluid. Of
3 course, it is recognized that a baffle type structure and/or
4 another configuration could be utilized so as to collect a
5 quantity of cryogenic fluid 60 and result in its substantially
6 abrupt release.

7 Since many modifications, variations and changes in detail
8 can be made to the described preferred embodiment of the
9 invention, it is intended that all matters in the foregoing
10 description and shown in the accompanying drawings be
11 interpreted as illustrative and not in a limiting sense. Thus,
12 the scope of the invention should be determined by the appended
13 claims and their legal equivalents.

14 Now that the invention has been described,